

REMARKS:

Original claims 1-28 are pending, as are newly added claims 29-33 which have been added to more particularly point out and distinctly claim desired embodiments of the disclosed invention.

The phrase “said oblique angle (α) being sufficiently offset from parallel with said longitudinal axis of said” (propeller shaft or propeller or adapter) “to resist compressive forces imposed by the corresponding spline located inside the hub of the corresponding propeller and axially aligned with said longitudinal axis” added to claims 1, 10, 18 and 26 are supported, for example by the last two sentences in paragraphs 10 and 12, the last sentence in paragraph 13 and the last sentence in paragraph 44.

The phrase “at least 8.5 degrees” added to claims 2, 11, 12, 14, 19, 20, 27, 29 and 31 is supported, for example, by paragraph 37, which recites “[t]o ensure that the force F_s will act at right angles to the splines.....the oblique angle β for the inner propeller shaft must therefore be= 8.5 degrees.” This statement indicates that a minimum force to ensure a sufficient right angle force optionally may be obtained by a minimum of 8.5 degrees for the particular example.

Claims 7, 15 and 23, which were dependent and had been objected to, have been amended by adding subject matter of the earlier referenced claims. Claim 6 has likewise been made independent by adding subject matter of earlier referenced claims. New claims 29-31 recite features from earlier claims 26-28 and more distinctly recite a desirable embodiment exemplified in Fig. 3 – Fig. 5 (also see for example, paragraph 36). New claim 32 recites the language of original claim 10, plus an added description of “spline (25) being turned in the same direction, as viewed from the rear with respect to a direction of travel.....” The added description is supported, for example by paragraph 35 of the specification. New claim 33 recites a combination of these same features. Accordingly, no new matter has been added.

Reconsideration and allowance courteously are solicited.

REJECTION UNDER 35 U.S.C. § 102(b):

Claims 1-3, 10-12, 26 and 27 were rejected under 35 U.S.C. §102(b) on anticipation grounds by Chilton (US 1803995). The Examiner has expressed a view that Chilton shows a “spline being oriented at an oblique angle with respect to a longitudinal axis of the propeller shaft.....” (page 2, middle, office action). However, only “one member” of Chilton is “oblique,” and this quality of obliqueness differs greatly from the claimed property. Chilton teaches that one member has splines “with a **slight** helix angle, the **splines** of the other member being **straight and parallel to the shaft axis** as usual.” (column 2 lines 1-4). This slight angle merely serves to keep the two members from being loose, and merely allows a tighter connection. There is no significant transfer of radial energy to the spline that would reduce the stresses on the other components as described in the present invention nor is there any suggestion for this solution to this unappreciated problem.

Chilton’s “slight” angle spline has a very small angle for a totally different purpose that fails to achieve a stated aim of the claimed embodiment, namely, “to reduce the stresses on the axial limit stops....to also reduce the stresses on those support surfaces” (paragraph 36). Thus, Chilton fails to allow “a simpler design” for axial limit stops such as a flange and end nut (paragraph 10, end). Even “the flange 17 and the end nut 18 can have a simpler design according to the claimed invention (but not according to Chilton) and the propeller shaft 15 can be made smaller while retaining its strength” as a result (paragraph 34, end). Chilton fails to teach how to make a suitable spline or other mechanism to achieve this and ignores the problem. A skilled artisan reading the specification readily appreciates that the oblique angle intended to carry out this aim of alleviating stresses on the axial limit stops (and allow their simpler/smaller design) radically differs from that intended by Chilton. The language added to the claims now more particularly points out and distinctly recites these differences from Chilton.

Chilton merely teaches a minor angled shift in a regular spline to overcome manufacturing tolerances to make a tighter fit for splines. In contrast, the claimed embodiment of the claimed invention reduces “induced stresses on the axial limit stops.....compared to

conventionally configured arrangements” (paragraph 16). Chilton in fact uses a conventionally configured arrangement that has a slight modification to one member to allow better fitting, but does not teach reducing stress (and thus reducing size) on axial limit stops such as flanges or end nuts. Thus, the problem appreciated by the present inventors, the solution, the differently configured parts, and how they are used, are not described by Chilton.

Chilton’s lack of appreciation of the problem of axial stress and lack of appreciation of the solution proposed, means that Chilton does not motivate a reader to achieve the combination of features as claimed. Chilton actually teaches making a slightly oblique angle on only one member for a different purpose, and thus can be seen as teaching away from the combination of two members both of which have significantly enough oblique splines to minimize axial stress on other parts, and thus allow modification of those other parts.

To more particularly point out and distinctly claim these differences from Chilton, the features of “oblique angle (α) being sufficiently offset from parallel with said longitudinal axis of said propeller shaft (15) to resist compressive forces imposed by the corresponding spline located inside the hub of the corresponding propeller and axially aligned with said longitudinal axis of said propeller shaft (15)” have been added to claims 1, 10, 18 and 26 (and their dependent claims 2-5, 11-14, 19-22).

Claims 15-17 further recite features that are lacking in the cited references; namely, the use of two or more propellers with “different” oblique angles. Claims 23-25 similarly recite this with a plurality of adapters. Claims 2, 11, 12, 14, 19, 20, 27 and 31 additionally specify that the angle be at least 8.5 degrees. Reconsideration and removal of the anticipation rejection courteously are solicited.

REJECTION UNDER 35 U.S.C. § 103(a):

Claims 1, 4-6, 10, 13, 14, 18-22 and 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Piehl (US 4498874) in view of Chilton. But, as the Examiner admitted “Piehl does not disclose the spline being oriented at an oblique angle with respect to a longitudinal axis of the propeller shaft as claimed.” Piehl emphasizes a spline (23c, 23d) for merely transferring torque (column 2 lines 46-52) and, even if combined with Chilton, lacks this element. Even more so these references do not teach or even acknowledge the problem solved by the claim element “oblique angle (α) being sufficiently offset from parallel with said longitudinal axisto resist compressive forces imposed by the corresponding spline located inside the hub of the corresponding propeller and axially aligned with said longitudinal axis” recited in amended claims 1, 10, 18, and 26, which more particularly points out and distinctly claims this feature. Neither reference even acknowledges the problem recognized nor solved by the claimed invention and has any teaching whatsoever towards adding an oblique angle to splines sufficient enough to transfer axial energy away from the other parts, and therefore allow a narrower shaft, and smaller parts. No such motivation arises from a reading of either reference.

Because no reference supplies the element of a sufficient oblique angle offset from parallel to resist compressive forces (as now more particularly recited in the claims), a prima facie case of obviousness does not exist and removal of the rejection courteously is solicited.

OBJECTED TO CLAIMS 7-9, 15-17 AND 23-25

Applicants thank the Examiner for inviting the rewriting of these claims, which have been rejected as being dependent upon rejected base claims. These claims have been amended to include text from their preceding base claims. Reconsideration and allowance earnestly are solicited.

NEW CLAIMS 29-33

Claims 29-31 recite at least two counter-rotating propeller shafts that contain splines, which have oblique angles. The oblique angles are of opposing angles, which correspond to their opposing directions of rotation. These features are not described or suggested in the cited references, either separately or even taken together, yet can be found in the originally filed claims. New claims 29-31 more distinctly recite a desirable embodiment exemplified in Fig. 3 – Fig. 5, which the cited references lack. New claim 32 recites original claim 10, plus an added description of “spline (25) being turned in the same direction, as viewed from the rear with respect to a direction of travel . . .,” which the cited references lack. New claim 33 likewise recites a similar combination of these latter features, which are lacking in the cited references. Consideration of these re-drafted claims and their allowance earnestly are requested.

COPENDING U.S. 10/248,891

Applicants point out that Hackett (Publication Number WO 01/21994) and Snell (Pat. No. 4,292,001) have been asserted against similar claims in U.S. application No. 10/248,891.

Applicants note that Hackett fails to disclose splines of the propeller shaft and that of the propeller having oblique angles (and associated features as claimed) with respect to a longitudinal axis of the propeller shaft and the propeller respectively. Thus, Hackett lacks one or more elements of each claim and should not be asserted as art against the amended claims.

Snell has been asserted as teaching splines at an oblique angle. Like Piehl asserted in the present case, however, Snell teaches a nuanced shaft to prevent looseness (“axial movement of the shaft” abstract) by use of a screw to lock in place. In particular, Snell uses “axial pins (14) arranged in bores (15) which are parallel to the common axis of the hub and which intersect the interdigitated splines” (abstract). Thus, the splines do not carry the axial force as described in the amended claims. In contrast, the present claimed invention provides sufficient oblique angle to

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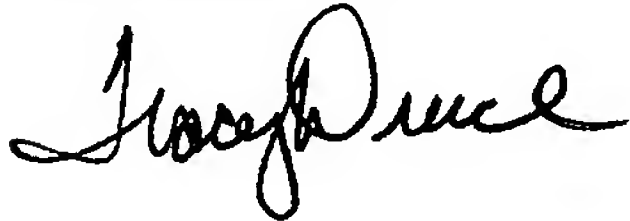
transfer force away from the support surfaces and allow smaller shaft and axial limit stops. Snell does not teach or describe these features.

The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 14-1437, Order No. 7589.196.PCUS00.

In order to facilitate the resolution of any issues or questions presented by this paper, the Examiner should directly contact the undersigned by phone to further the discussion.

Respectfully submitted,



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